Intraarticular Hyaluronic Acid Injection for the Treatment of Reducing and Nonreducing Disc Displacement of the Temporomandibular Joint

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Abstract: Temporomandibular dysfunction (TMD) has been established as a therapeutic challenge in the plastic and maxillofacial clinics. The current treatment recommendations for TMD include resting the jaw, soft diet, and pain medication with nonsteroidal analgesic agents. If conservative and noninvasive techniques do not work, more invasive techniques may be considered. The main goal of this study was to assess the safety and clinical utility of intraarticular injection of sodium hyaluronate for the treatment of symptoms associated with internal derangement of the temporomandibular joint (TMJ).

In this prospective study, 40 TMJs of 33 patients who have TMD were treated with intraarticular sodium hyaluronate injections at weekly intervals for 3 weeks. Pre- and postinjection pain intensity, the presence of joint sounds, and interincisial distance were documented. The follow-up period was 12 months. There was a statistically significant reduction of pain intensity ($P < 0.01$) and joint sound ($P < 0.05$) in all patients.

This study shows that intraarticular hyaluronic acid injection for the treatment of reducing and nonreducing disc displacement of TMJ is an effective and safe management.

Key Words: temporomandibular joint, temporomandibular disease, hyaluronic acid, intraarticular injection

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The term temporomandibular joint (TMJ) dysfunction is used to describe a group of conditions that include painful myofascial problems involving the muscles of mastication, internal derangements of the joint space contents, congenital and developmental abnormalities of bony components, arthritis, infections, and tumors of the TMJ. Clinically, temporomandibular dysfunction (TMD) is characterized by a single sign or a combination of signs and symptoms of pain, clicking, crepitus, and irregular jaw function. The condition affects the quality of life in a significant part of the population. This is a relatively common condition occurring at any age with a predilection for women at their early adult ages.[1] The most common forms of TMD are divided into 3 major groups depending on the presumed site of pathophysiology: Group 1 diseases are disorders of the muscles of mastication. Group 2 diseases are internal derangements of the joint space contents. Group 3 diseases are arthritis or arthrosis of the joints. The diagnosis of TMD was improved by the use of magnetic resonance imaging techniques, which have now became the gold standard in the diagnosis of group 2 disease.[2] The primary goal of therapeutic management of the TMD is pain relief, protection of range of motion, and prevention or restoration of secondary functional disability and joint damage. Conservative management including jaw habit control, soft diet, nonsteroidal anti-inflammatory drugs (NSAIDs), splints, and bite guards should be tried before any invasive procedures are considered. Surgical interventions such as arthrocentesis, disc repositioning, or discectomy are recommended for patients with resistant internal derangement, yet the effectiveness of these methods is still controversial.[3,4]

Intraarticular hyaluronic acid (HA) injection is commonly used to treat orthopedic diseases and is called viscosupplementation. It has also been used for the treatment of TMJ arthritis.[5]

The aim of this prospective study was to assess whether the repeated injections of hyaluronic acid into the temporomandibular joint help to minimize the symptoms that were unresponsive to conservative measures.

MATERIALS AND METHODS

Study Design

A randomized prospective study with a 12-month follow-up period was designed. A total of 40 TMJs of 33 patients who did not respond to conservative treatments were included in the study between July 2004 and January 2007. The patients were informed about the study, and written consent was obtained from all patients. Radiologic evidence of internal derangement of TMJ was checked and the presence of disc displacement was evaluated by magnetic resonance imaging (MRI). Joints were assigned with the description of joint pathology in 2 groups. Group 1 (n = 20) was composed of joints with reducing disc displacement. Group 2 (n = 20) was composed of joints with nonreducing disc displacement.

All of the injection procedures were conducted by the same physician. Patients were treated with intraarticular sodium hyaluronate (Ostenil, 20 mg sodium hyaluronat/2 mL, TRB Chemedica, Vouvry, Switzerland) injections at weekly intervals for 3 weeks. The use of nonsteroidal anti-inflammatory drugs (NSAIDs) was not permitted during the study. At the initial visit, from every patient, the demographic data (age, gender, and former treatment) were collected. The presence or absence of joint pain and the induction of a pathologic noise with joint movement was assessed. Interincisal distance at maximal mouth opening was recorded and the patient was asked to quantify the pain on a visual analog scale (VAS). All assessments were repeated by the same physician 1, 6, and 12 months after the last injection.

Injection Technique

After disinfection of the preauricular area with 10% povidone iodine solution, a total of 1 mL HA solution was injected into the upper TMJ compartment using a 23-gauge needle during maximal mouth opening. No topical or intraarticular anesthetics were used.

Statistical Analysis

SPSS for Windows software (SPSS Inc., Chicago, IL) was used for data management and statistical analysis. The paired sample *t* test and one-way repeated measure analysis of variance (ANOVA) were used to compare the study groups with respect to pain intensity

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and mouth opening measurements. The Wilcoxon signed rank test was performed for groups to test for changes of joint sound. The level of significance was set at 0.05 for all statistical tests.

RESULTS

All patients included in the study were followed for a period of 12 months. No complications were observed due to intraarticular injection except for minor local reactions, including temporary swelling, warmth and pain at the injection site. Detailed data about patient demographics, clinical presentations, and outcomes are presented in Tables 1 through 3.

Group 1 (Joints With Reducing Disc Displacement)

Patient ages ranged from 16 to 52 years, with a mean age of 28.3 ± 9.3 years. Two of the patients were male, and 13 were female. Before any injection, the mean VAS score was 6.80 ± 1.70. At the final follow up, the median score was 2.75 ± 1.55 (Fig. 1). The difference among the 2 values was statistically significant ($P < 0.01$). Initial measurements of maximal mouth opening revealed a range between 2.70 cm and 4.80 cm, with a mean of 3.76 ± 0.64 cm. At the end of the study, the same measurements were repeated and interincisal distance ranged between 3.00 cm and 4.70 cm, with a mean of 3.88 ± 0.51 cm. The difference between the 2 measurements was not statistically significant ($P > 0.05$). Twenty joints had pathologic sounds (16 cases with clicking and 4 cases with crepitation) at the first examination. After the treatment only 11 joints had a pathologic sound (10 cases with clicking and 1 case with crepitation) ($P < 0.05$).

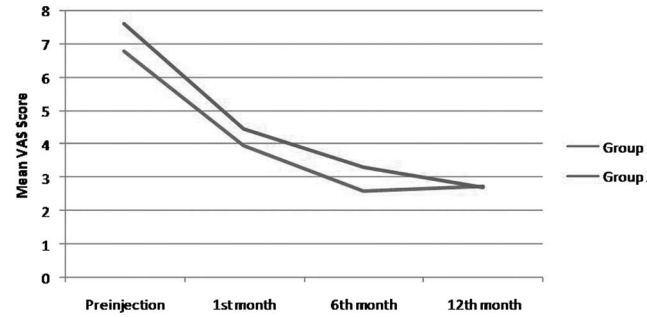

FIGURE 1. VAS variables of both groups during the follow-up period. Group 1, joints with reducing disc displacement; group 2, joints with nonreducing disc displacement.

Group 2 (Joints With Nonreducing Disc Displacement)

Patient ages ranged from 16 to 55 years, with a mean age of 34.83 ± 14 years. The female-to-male ratio in this group was 16 women versus 2 men. Before any injection the mean VAS score was 7.60 ± 1.50. At the final follow up, the mean score was 2.70 ± 1.38. The difference between the 2 values was statistically significant ($P < 0.01$). Initial measurements of the interincisal distance during maximal mouth opening in all patients revealed a range between 2.50 cm and 5.00 cm, with a mean of 3.32 ± 0.60 cm. At the end of the study, the same measurements were repeated and interincisal distance ranged between 2.50 cm and 5.00 cm, with a mean of 3.47 ± 0.59 cm. The difference between the 2 measurements was not statistically significant ($P > 0.05$). At the initial consultation, crepitation was noted on 8 joints, whereas 12 joints had no pathologic sounds. After the treatment, no pathologic joint sounds were detected in any of the joints ($P < 0.05$).

TABLE 1. Demographic Data of Patients

	Group 1	Group 2
Patients (n)	15	18
Joint (n)	20	20
Female/male (n)	13/2	16/2
Mean age in years	28.3 (±9.3)	34.8 (±14)

Group 1, joints with reducing disc displacement.
Group 2, joints with nonreducing disc displacement.

TABLE 2. Results of Group 1 (Joints With Reducing Disc Displacement)

	Preinjection	1 Month	6 Months	12 Months
VAS	6.80 (±1.70)	3.95 (±1.95)	2.60 (±1.63)	2.75 (±1.55)*
Mouth opening	3.76 (±0.64)	3.77 (±0.57)	3.88 (±0.49)	3.88 (±0.51)**
Clicking (n)	16	13	10	10***
Crepitation (n)	4	0	0	1****
No sound (n)	3	7	10	9

VAS indicates visual analog scale score.
*$P < 0.01$; **$P > 0.05$; ***$P < 0.05$; ****$P < 0.05$.

TABLE 3. Results of Group 2 (Joints With Nonreducing Disc Displacement)

	Preinjection	1 Month	6 Months	12 Months
VAS	7.60 (±1.50)	4.45 (±2.08)	3.30 (±1.34)	2.70 (±1.38)*
Mouth opening	3.32 (±0.60)	3.38 (±0.58)	3.42 (±0.58)	3.47 (±0.59)**
Clicking (n)	0	0	0	0
Crepitation (n)	8	3	0	0***
No sound (n)	12	17	20	20

VAS indicates visual analog scale score.
*$P < 0.01$; **$P > 0.05$; ***$P < 0.05$.

DISCUSSION

Intraarticular HA injection is a relatively new method for the treatment of internal derangement of TMJ. Hyaluronic acid is a high molecular weight polysaccharide distributed throughout the body particularly as a principal component of the synovial fluid and cartilage. Its major role is to maintain the viscoelastic structural and functional characteristics of the articular matrix. It is also incorporated in joint stabilization and may mediate nutrition to the avascular surfaces of the joint.[6,7]

Several preparations of HA such as high molecular weight hyaluronan, sodium hyaluronate and Hylan G-F20 have been widely used in the treatment of osteoarthritis in orthopedic practice. This treatment, called viscosupplementation is administered as a course of injections into the joint and is believed to supplement the viscosity of the synovial fluid, thereby lubricating and cushioning the joint. Hylan G-F20 preparation has significant adverse effects called pseudoseptic reaction.[8] Chen et al[9] reported 6 cases of granulomatous inflammation after the intraarticular Hylan G-F20 injection. In another study,[8] the incidence of adverse reactions occurring in patients treated with Hylan G-F20 has been reported to be between 2% to 8%. However, similar reactions have not been reported with the injection of other preparations.[8]

Intraarticular preparation of hyaluronic acid has also been reported to have pain-relieving effects on symptomatic joints in previous studies. This effect may be derived via its anti-inflammatory effects such as inhibition of phagocytosis, chemotaxis, prostaglandin synthesis, metalloproteinase activity, and removal of oxygen radicals from synovial tissue.[10–12] Similar anti-inflammatory effects may also be obtained by intraarticular corticosteroid injections. Therefore, corticosteroid injections have been used for the treatment of a variety of TMJ diseases. However, Bjornland et al[13] showed that intraarticular HA injection is significantly more effective in decreasing pain intensity than corticosteroids. Furthermore, some other studies reported the possibility of marked side effects such as condylar resorption, articular capsule and ligament weakening, and progression of an existing disease resulting from the use of intraarticular corticosteroids.[13,14]

Promising results have been reported for the intraarticular injection of HA in patients with reducing and nonreducing disc displacement of TMJ. Yeung et al[15] conclude the short-term results of intraarticular HA injection for nonreducing disc displacement of TMJ with their well-designed controlled studies. Their findings showed that, when compared with preinjection measurements, mouth opening decreased while pain intensity and prevalence of joint sound was decreasing.[15] Similar findings were reported by Hepguler et al[16] as intraarticular HA injections reduced the symptoms in patients with reducing disc displacement of TMJ in their series with a follow-up period that was restrained to 6 months.

In the current study, we considered the use of intraarticular HA injection for the treatment of reducing and nonreducing disc displacement of TMJ with long-term follow-up. In both groups the subjective intensity of pain, as outlined in terms of VAS scores, were improved after 12 months postinjection. The difference encountered among the pre- and postinjection scores was statistically significant. No significant difference between the 6th and 12th month VAS score results was observed, which showed that the main effect of HA in terms of pain relief appeared within the first 6 months and persisted to 12 months. Yeung et al[15] reported that, in their series, mouth opening was reduced 1 month after injection. This is in contrast to our study as none of our patients experienced a reduction in interincisal distance measurements during maximal opening. Furthermore, slight increase in maximal mouth opening was observed for both of groups.

Joint sounds were also decreased after HA injections in our series. Especially, crepitation was completely vanished in all patients with nonreducing disc displacement. This result is not comparable to a similar study by Yeung et al[15] as they did not find a significant change in the joint crepitus. Joint clicking was noted in 16 joints (80%) with reducing disc displacements prior the HA injections, and this was reduced to 10 joints (50%) 12 months after the injections.

This study shows that intraarticular HA injection is an effective tool in reducing the pain and symptoms associated with internal derangement of TMJ. The beneficial effects persist at least for a period of 1 year after injection without the presence of a pronounced side effect. In conclusion, this minimally invasive application offers a safe management for the treatment of reducing and nonreducing disc displacement of TMJ.

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